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材料物理和化学

石墨烯柔性透明导电薄膜的制备

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摘要：采用液相剥离法，以石墨粉末为原料，在有机溶剂中直接超声剥离，通过高速离心后得到质量较高的石墨烯分散液。利用喷涂法，在柔性基底(PET)上制备石墨烯透明导电薄膜。借助SEM、四探针等表征方法，研究不同有机溶剂和不同基底处理对薄膜表面形貌和光电性能的影响。结果表明：使用DMF作为分散剂制备的石墨烯没有引入其他官能团，结构缺陷少；在基底上做一层银金属栅网，可以有效降低薄膜的方块电阻，在透过率($\lambda=550\text{ nm}$)为81%时，方块电阻降低为 $172\ \Omega/\square$ ，这种新型石墨烯/银金属栅网柔性透明导电薄膜有望取代市场主流ITO薄膜。

关键词：石墨烯 液相剥离 柔性基底 银金属栅网

Preparation of Graphene Flexible Transparent Conductive Films

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Abstract: Graphite powder as the raw material was directly sonicated in organic solvents by the liquid-phase exfoliation method, to produce high quality graphene dispersion through a high-speed centrifugation. The spray-coating method was used to prepare transparent and conductive graphene films based on flexible substrates (PET). The influence of different organic solvents and substrate treatments on the surface morphology and photoelectric properties of graphene films was studied by SEM and four-point probe tester characterization methods. The results show that graphene films are less structural defects and don't introduce other functional groups by using DMF as the dispersant. The substrate processed with silver metal grid can effectively reduce sheet resistance of the film, and the sheet resistance is reduced to $172\ \Omega/\square$ when the transmittance is 81% ($\lambda=550\text{ nm}$). This new structure of graphene/silver metal grid flexible transparent conductive film is expected to replace the market mainstream ITO film.

Keywords: graphene liquid-phase exfoliation flexible substrate silver metal grid

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